

Research on the Ductility of Dashed Graph Rendering in Adobe Photoshop

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Abstract: Dashed lines are a special form of lines. The study of dotted lines composed of various forms of points is an extension of the study of computer graphics. The significance of this study is to enhance and utilize the graphical functions of the computer software Adobe Photoshop. Through this research, it is attempted to clarify various applications of the expanded dotted line drawing function, especially in art and design education, to help solve the difficulties encountered by Adobe Photoshop software in the teaching of basic courses. The results of this research provide a comprehensive method for integrating the expanded dotted line drawing function in Adobe Photoshop into artistic design practice and propose the possibility of further research in the field of computer graphics. The results of this study are beneficial to the effective development of teaching methods and advances in computer graphics technology for art and design professionals.

Keywords: Adobe Photoshop graphic rendering research; promotion; utilization

1. Introduction

Adobe Photoshop, or "PS" for short, is an image processing software developed and distributed by Adobe Systems. Photoshop deals primarily with digital images made up of pixels. With its numerous editing and drawing tools, we can effectively edit and create pictures. PS has many functions, in the image, graphics, text, video, publishing and other aspects are involved. In this paper, we investigate the ductility of dotted line drawing in Adobe Photoshop can improve and enhance the use of computer software graphics function. In addition, the study of dotted lines in their various forms can have a profound impact on the field of art and design. Therefore, the content of this paper is mainly concerned with the significance of research on the ductility of dotted line drawing in Adobe Photoshop, the research method of dotted line drawing in Adobe Photoshop, and the method and application of dotted line drawing in Adobe Photoshop. Through this research, it is attempted to clarify various applications of the expanded dotted line drawing function, especially in art and design education, to help solve the difficulties encountered by Adobe Photoshop software in the teaching of basic courses.

2. The significance of research on the rendering extensibility of dotted lines in Adobe Photoshop

The concept of point as the basic unit of modeling has long been established in the field of computer graphics. In addition, lines are the trajectory of point motion, and dotted lines represent a unique form of the line. The study of dotted lines composed of points is an extension of the study of computer graphics. The significance of this study lies in the improvement and utilization of the graphical functions of computer software. In addition, the study of various forms of dotted lines can have a profound impact on the field of art and design.

Adobe Photoshop is a widely recognized and powerful graphics and image processing software. This article aims to explore the methods and techniques used to expand the dotted line drawing function in Adobe Photoshop. Through this research, it is attempted to clarify various applications of the expanded dotted line drawing function, including its application in art and design education, such as the teaching of "Graphic Composition" and "Color Composition" courses. The results of this research provide a comprehensive method for integrating the expanded dotted line drawing function in Adobe Photoshop into artistic design practice and propose the possibility of further research in the field of computer graphics [1].

Adobe Photoshop has had a significant impact on the art and design industry with its powerful

image-processing capabilities. Its powerful functions and multiple tools enable creative expression and precise design, making it an indispensable tool for artists and designers. Adobe Photoshop has changed the way we design art and has become an important part of modern art design practice. Although it has been widely used in the art and design industry, its little-known graphics processing functions and advantages have not yet been fully explored. Although there have been many articles on the internet introducing Adobe Photoshop's method of drawing dotted lines, it cannot meet the needs of art and design professionals, especially Adobe Photoshop software, which solves the difficult teaching problems of basic courses such as "Graphic Composition" and "Color Composition".

Therefore, this study aims to explore the method of drawing dashed lines in Adobe Photoshop and its potential significance for improving art and design teaching. This study will adopt a systematic approach to determine the appropriate techniques for drawing dashed lines in Adobe Photoshop and their effectiveness in generating high-quality graphics. The results of this study are beneficial to the effective development of teaching methods and advances in computer graphics technology for art and design professionals.

3. Research Method of Dotted Line Graphics Rendering in Adobe Photoshop

Based on our experience in the reform of the art design curriculum, this research solves the challenge of using computer technology to teach and practice the two basic courses in this field, "Graphic Composition" and "Color Composition." This research is based on the reform of the art design curriculum, focusing on drawing complex dotted lines and summarizing them as dot and square points and arbitrary point dotted lines, and exploring their rendering methods. This not only solves the problem of using computer software in the above courses but also implements the project-driven teaching method in Adobe Photoshop courses. This study serves as a representative case of a project-driven approach in the context of art design teaching. In addition, the results of this study demonstrate the potential of project-driven approaches in improving art and design education^[2].

4. The Method and Application of Drawing Dashed Lines in Adobe Photoshop

4.1. Drawing Method and Application of Dot and Dash Pattern

4.1.1. Drawing method and application of dot and circle graphics

(a) Brushstroke path method: First draw a circular path and select the drawn path → set the brush shape to a circular shape and adjust the brush spacing parameters to achieve a dotted line effect → stroke the circular path with a brush → repeatedly adjust the brush spacing parameters until the distance between the points in the circular dotted line is equal (As shown in Figure 1-5).

The brush stroke path method is a fast method for drawing dashed lines, but due to the need to adjust the distance between the first and last two points and the lack of standardization, the results are inaccurate. However, this method can produce multiple effects by adjusting brush parameters, including gradients and other visual effects. Despite limited accuracy, the brush stroke path method has the advantage of being highly flexible and can be widely used in various graphic creations. By adjusting brush shape and spacing parameters and changing the shape of paths, designers and artists can achieve visually compelling results. For example, a font composed of pearl-shaped strokes, a circular dotted line surrounded by small stars, and a pentagonal dotted line surrounded by small stars.

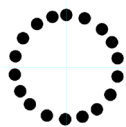


Figure 1: Dot circle

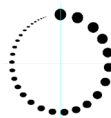


Figure 2: Dot circle

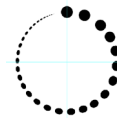


Figure 3: Dot circle



Figure 4: Dot circle



Figure 5: Dot circle

(b) Copy Transform (Rotate) Circular Path or Layer Method: Draw a circular path or layer → Perform Copy Transform (Rotate) → Repeat the previous step (As shown in Figure 6 and 7).

Although the brush stroke path method provides a fast method for drawing circular dotted lines, it lacks standardization and accuracy due to the difficulty in obtaining accurate results at a fixed distance between the first and last two points. The copy transform (rotation) circular path or layer method provides a more accurate method for drawing circular dotted lines with dots, but its small dot rotation angle is limited to a multiple of 360 degrees, with a single effect. If you change the size of a point while rotating it, you can create visually appealing swirling dashed lines, but only for circular or swirling shapes. It is worth noting that although this method may only have a single application, its accuracy, and specificity make it the preferred method for some designs.

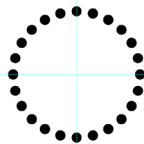


Figure 6: Dot circle



Figure 7: Dot circle

4.1.2 Drawing methods and applications of dot and square graphics

(a) Brushstroke path method: first draw a square path → set the brush shape as a dot (and set the brush spacing parameter to make it a dotted line) → stroke the path with the brush → repeatedly adjust the brush spacing parameter and stroke the path so that the distance between the dots in the dotted line is equal, mainly by adjusting the spacing between the beginning and end points (As shown in Figure 8 and 9).

Although this method is simple to do, it may not always produce standardized results because there may be no points on the four corners, and the brush spacing parameter may need to be adjusted experimentally to achieve accuracy. However, it provides the flexibility to change the size and shape of points. In addition, this method can be used to create dashed lines of any path shape.

The combination of brushes and paths in Adobe Photoshop allows for an almost infinite range of possibilities in any form. By using different brush shapes and adjusting spacing parameters, you can create a variety of dashed line styles, from simple and standard to complex and innovative. In addition, by combining these brush shapes with various path shapes, such as circles, squares, triangles, and other geometric shapes, many complex designs can be achieved. This flexibility in design allows artists and designers to explore and experiment with different concepts, textures, and visual effects.

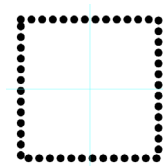


Figure 8: Dot square



Figure 9: Dot square

(b) Copy and transform a straight line path or layer method: Draw a dotted line (mark the spacing) → Copy and move multiple times to form a dotted surface → Delete the points in the middle (As shown in Figure 10).

The process of drawing dashed lines using the copy transform line path or layer method may be more complex and involve more steps, but the resulting graphics are highly standardized and accurate. This method requires careful consideration of brush shape, spacing, and path formation to achieve the desired effect. Although mastering it may require more time and effort, the level of accuracy and consistency it provides is unparalleled. In addition, this approach provides unlimited possibilities for creating unique and customizable dotted line designs. However, this method is limited to a single application because it can only be used to draw square dashed lines. However, it is still a reliable method of creating square dashed lines with precision and standardization.



Figure 10: Dot square

(c) Drawing method of combined dot and dotted line: Draw a circular dotted line → Copy, rotate, and move to form a square, polygon, or star (As shown in Figure 11 and 12).

Although this method is complex and time-consuming, it can generate accurate and standardized graphics. It is widely used in the industry and is considered the most accurate method for drawing polygons and polygonal dashed lines using the software. Although it is complex, it is a practical method that can be effectively applied to art and design projects [3].

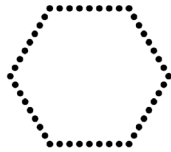


Figure 11: Dot square

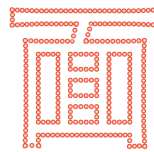


Figure 12: Dot square

4.2 Drawing Method and Application of Square Dot Dash Line

4.2.1 Drawing method and application of square dot circular graph

(a) Brushstroke path method: Draw a circle path → Set a square point shape brush → Use a brush to stroke the path → Adjust parameters (As shown in Figure 13-16).

This method is relatively simple to implement, although the generated graphics may not strictly adhere to the shape of square points or circles. Setting these parameters can be challenging, and there may be problems with uneven spacing or missing points. Therefore, the generated dashed lines may not be completely accurate, and this method is best suited for smaller point sizes. Despite its limitations, this method is widely used as the 3.1 method for drawing circular dots and dotted lines.

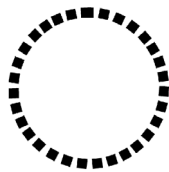


Figure 13: Square dot circle



Figure 14: Square dot circle

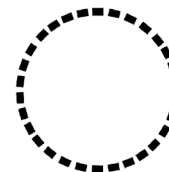


Figure 15: Square dot circle

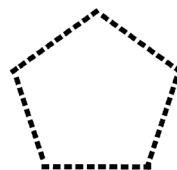


Figure 16: Square dot circle

(b) Copy Transform (Rotate) Square Path or Layer Method: Draw a square path or layer → Perform Copy Transform (Rotate) → Repeat until a circular dashed line is formed (As shown in Figure 17, square dot circle).

This approach involves simple manipulation and produces standardized graphical specifications. However, its rotation angle is limited (can only be divided by 360 degrees). Despite this limitation, it is still the most accurate method for drawing square dots, circular dashes, and is widely used in various designs. The simplicity of this method also allows users who may not have advanced drawing skills or experience using more complex tools to use it.

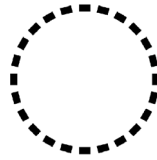


Figure 17: Square dot circle

(c) Ring cutting method: first create a solid line ring → create a long strip path (with the same center as the ring and a length greater than the diameter of the ring) → copy and rotate the long strip path for a total of 360 degrees (with an even number of degrees of rotation) → convert the copied and rotated path to a selected area and press the delete key to delete it (first convert the long strip path to a selected area and delete it, then rotate and delete it again. Rotate and delete it once, until it is deleted one revolution along the ring), as shown in Figure 18, square dot circle.

This method provides a more accurate and standardized method for drawing square point circles. Although it may involve more steps and be more complex than other methods, the resulting graph is strictly square and has an even number of points. The shape of these dots also makes them longer on the outside and shorter on the inside, creating a unique and visually appealing effect. This method is particularly suitable for creating large square point circles but can be more complex when the circles are small and the number of points is small.

Overall, this method is a practical and accurate method that can achieve accurate square dotted circles, making it an effective method for graphic design and other applications.

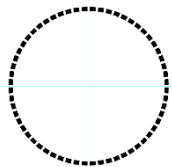


Figure 18: Square Dot Circle

4.2.2 Drawing method and application of square dot and square graph

(a) Brush stroke path method: Draw a square path → Set a square point shape brush → Use a brush to stroke the path → Adjust parameters, as shown in Figure 19 and 20.

This method is relatively easy to use, but achieving standardized shapes can be challenging, especially for corners. Although square points can be relatively easy to implement, rectangular points may be more difficult to standardize. However, this method is still widely used due to its versatility, allowing the creation of a series of shapes with rich artistic effects.



Figure 19: Square point square



Figure 20: Square point square

(b) Copy and transform a straight line path or layer method: Draw a square dotted line (note the spacing) → Copy and move multiple times to form a virtual surface → Delete the middle part (As shown in Figure 21 and 22).

Although this method may be more complex than some other methods, it can make the generated graphics more accurate and consistent, especially when achieving perfect square dotted lines. This method can only be used to make square dotted lines. When using this method, it is important to pay attention to the spacing between square points to ensure uniform distribution of square points and create a good overall effect [4].

Although this method may have a single application in the shape of points, it can still be creatively combined with other design elements to create unique and interesting visual compositions.

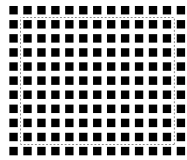


Figure 21: Square point square



Figure 22: Square point square

(c) Combined square dot dotted line graphic rendering method: Draw a square dot dotted line → Copy, rotate, and move to form a square, polygon, or star (As shown in Figure 23 and 24).

The method of combining square dots and dotted lines involves a more complex set of steps, requiring more time and effort, but generating standardized and accurate graphics. It is the best method to achieve accurate and standardized polygonal square points and dotted lines, and is widely used by designers.

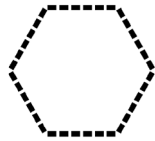


Figure 23: Square point square



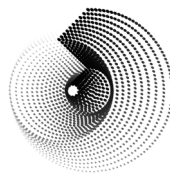
Figure 24: Square point square

4.3 The Drawing Method and Application of Arbitrary Dotted Line Graph

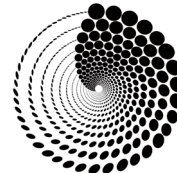
The method is the same as that of drawing square dot dotted line graphics.

5. Research Summary

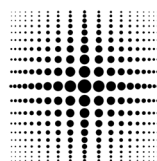
- 1) The recommended method for drawing circular dotted lines is to copy and convert (rotate) the circular path or layer to create the desired shape;
- 2) In terms of application and effect changes, the dotted circle drawing method (a) provides a variety of brush shapes and stroke path options, while the method (b) can create beautiful swirling line shapes;
- 3) If you need to create a strict square dot circular dotted line graph, the best method is the (c) method of the square dot circular dotted line drawing method - the ring cutting method;
- 4) When drawing a square or angular dot dotted line graph, the square dot square graph drawing method (c) - the combined square dot dotted line graph drawing method is the most effective;
- 5) Adobe Photoshop's rich path transformation and powerful rotation and scaling tools are combined to create many flexible and creative graphics. Application illustrations 1 to 6 demonstrate the feasibility of combining path transformation with different brush parameter settings.



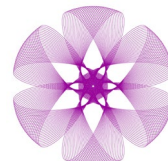
Application 1



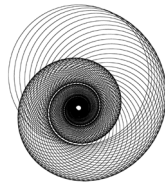
Application 2



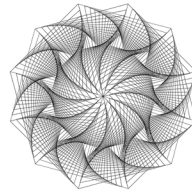
Application 3



Application 4



Application 5



Application 6

References

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